

biological and agricultural needs in a field which is of basic importance in the North American Desert."

F. W. SOHON, S. J. *The Stereographic Projection.* Chemical Pub. Co., New York. 1941.

This book, by the Director of the Seismological Observatory, Georgetown University, Washington, D. C., is devoted to a very detailed and complete mathematical development of the theory, properties, and some of the

applications of the stereographic projection, often by methods original with the author.

The stereographic projection, devised by the ancient Greeks, is perhaps the most generally all round useful of projections; and is important in many fields of applied mathematics in addition to cartography. The meteorologist is likely to encounter it not only among the synoptic maps with which he works but also in the course of his auxiliary studies in mathematics and physics.

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR JUNE 1941

[Climate and Crop Weather Division, J. B. KINCER in charge]

AEROLOGICAL OBSERVATIONS

By EARL C. THOM

The mean surface temperatures for June were above normal over somewhat more than half of the country. Temperatures were above normal generally over the eastern half of the country and over parts of the extreme north and extreme west. The largest positive departure for the month, from 5° to 6° F. above normal, occurred in an area over the northern Great Lakes. Most of the western half of the country was somewhat below normal, a considerable area of the southern plateau region being from 2° to 3° lower than normal for the month.

At 1,500 meters above sea level the 5 a. m. resultant winds were from directions to the south of normal over most of the country. The opposite turning of the resultant winds from the normal at this level occurred at Medford, Oreg., over the extreme Northeastern States and over Oklahoma and eastern Texas. At 3,000 meters the morning resultant winds were from the south of normal over most of the country with the opposite turning occurring over New England and the upper Great Lakes as well as over a considerable part of the southern plateau and plains region. It was possible in the case of 17 stations to compare the direction of the 5 p. m. resultant winds for the month with the corresponding 5 a. m. normals. At 6 scattered stations the directions of the afternoon resultants were from directions somewhat more northerly than the corresponding morning resultants while the opposite shift was noted at this level for the other 11 stations.

The 5 a. m. resultant velocities for the 1,500 and 3,000 m. levels were below normal at most stations in that part of the northern two-thirds of the country which lies east of the Great Divide and were generally above normal at this level over the remainder of the country. At 5,000 meters the 5 p. m. resultant velocities were below the corresponding 5 a. m. normals over the northeast and north-central areas and were above the morning normals elsewhere.

The areas in which the 5 p. m. resultant winds at 1,500 meters were from directions to the south of the corresponding 5 a. m. winds, were not well defined and were about equal to the areas in which the opposite turning of the winds during the day occurred at this level. At 3,000 meters, however, most stations in the northern half and several stations in the south-central parts of the country had 5 p. m. resultant winds more southerly than the corresponding morning winds with the opposite shift occurring over most of the southern half of the country.

At more than half of the stations in the country the 5 p. m. resultant velocities were lower than the corresponding morning velocities at the 1,500 m. level. These p. m. velocities were higher than the a. m. velocities at this level, however, over parts of the extreme northwest, the extreme southwest and over portions of the North-Central and the Gulf States. At 3,000 meters the afternoon

resultant velocities for the month were higher than the morning velocities over most of the eastern half of the country and over the southern plateau and plains region while the morning resultant velocities were higher than those of the afternoon generally over the rest of the country.

The upper air data discussed above are based on 5 a. m. (E. S. T.) pilot balloon observations (charts VIII and IX) as well as on observations made at 5 p. m. (table 2 and charts X and XI).

At radiosonde and airplane stations in the United States proper, the highest mean monthly pressure at each of the standard levels from 1,000 to 16,000 meters occurred over stations along the southern border of the country. At 1,500 meters the highest mean pressure occurred over Pensacola, Fla., at 3,000 meters over Miami, Fla., while at 14,000 meters and at each of the levels from 8,000 to 12,000 meters the corresponding minima occurred over Brownsville, Tex. At the other levels from 2,000 to 16,000 meters the same highest mean value for the level occurred at two or more southern stations. The lowest mean monthly pressure at 2,000 meters was recorded over Great Falls, Mont. At 3,000 meters the minimum mean pressure occurred over the three northwestern stations. The corresponding minima occurred over Seattle at 2,500 meters as well as at each of the standard levels from 4,000 to 12,000 meters. The same lowest mean pressure for 13,000 meters was observed over both Medford and Seattle while the lowest mean pressures for the 14,000, 15,000, and 16,000 meter levels were recorded over Medford.

With but few scattered exceptions, noted at the 1,000-, 2,000-, and 3,000-meter levels, June mean monthly pressures were higher than those for the previous month at all of the standard levels above the surface at all United States stations. This increase in mean pressure values over those of last month was especially well defined at the levels from 5,000 to 11,000 meters over the northeastern part of the country where it amounted to about 8 mb. In Alaska all reported pressures were higher than those of last month at all levels. (Data for Barrow and Bethel not available.)

The largest difference between the highest and lowest mean pressure values for stations in the United States proper was 18 mb. which occurred at the 8,000-, 9,000-, and 10,000-meter levels. Steep pressure gradients were noted on the pressure charts especially across the Northwestern States at the levels from 5,000 to 11,000 meters. The steepest gradient, a change of 1 mb. for each 67 miles of horizontal distance, between Seattle and Boise, occurred at each of the three levels, 8,000, 9,000, and 10,000 meters.

The mean temperatures for June were higher than those of the previous month at all levels above the surface up to and including 11,000 meters for all stations of the United States, while except at Oakland and San Diego mean surface temperatures were also higher than those for May. Temperatures at each of the levels above 12,000 meters

were lower than those of May for the corresponding levels at five stations, were higher at each of these upper levels at three stations, with the upper levels at all other stations well divided between values higher and lower than the corresponding figures for the previous month. In Alaska all reported mean temperatures were higher than those for May at all levels up to and including 9,000 meters. At 10,000 meters Ketchikan reported a mean temperature 0.7° C. higher than for May, with temperature lower at this level at each of the three other Alaskan stations for which June data have been received. At 11,000 and 12,000 meters temperatures at each of the four stations were lower than in May. Above 12,000 meters data at hand indicates that temperatures were generally higher than in May over the area north of 60° N. latitude, and lower over that part of Alaska south of this latitude.

Comparison of the temperature charts for June 1941 with those for June 1940 indicates that at most of the levels from the surface up to and including 11,000 meters mean temperatures were the same or lower than those for June of last year at stations located in the western third of the country, in the North-Central States and along the southern Atlantic coast and were higher than last year at these levels over the rest of the country. At most levels above 12,000 meters temperatures were higher than last year. Exceptions to this were noted, however, at some of the upper levels over stations in the eastern third of the country and along the Gulf coast. Temperatures were higher than last year over Juneau, Alaska, at levels up to 9,000 meters and were lower at all higher levels.

At 1,000 meters temperatures were somewhat above normal over the extreme Northeast, the Great Lakes, and over parts of the east-central and the extreme north-central areas while temperatures were below normal elsewhere at this level. At the 3,000-meter level temperatures were below normal over most of the country, positive departures having occurred only over an area in the extreme North-Central States and over the Gulf and South Atlantic coastal regions. At the 5,000-meter level temperatures were below normal over the western one-third of the country as well as over a small area in the Central States and over the north half of the Atlantic coast, while

temperatures were above normal elsewhere over the country at this level.

The mean monthly relative humidity for the month was generally above normal at the 1,000-, 3,000-, and 5,000-meter levels. Relative humidities were below normal only for a few widely scattered stations at each of these three levels.

The altitude, at which the mean monthly temperature of 0° C. occurred, varied over the United States, being lowest (2,700 meters) over Seattle and highest (5,000 meters) over Brownsville. The level at which, on the average, freezing conditions occurred was higher than in May at all stations in the United States, the greatest increase in the height of this level occurring over the New England States where it averaged 1,100 meters higher than last month.

The lowest temperature reported in the free air over the United States during June was -78.7° C. (-109.7° F.). This temperature occurred over Brownsville, Tex., on the morning of June 12 at an altitude of 16,800 meters (about 10½ miles) above sea level.

Table 3 shows the maximum free air wind velocities and their directions for various sections of the United States during June as determined by pilot balloon observations. The highest wind velocity for the month was 85.0 m. p. s. (190 m. p. h.) observed over Albuquerque, N. Mex., on June 17. This high wind was blowing from the west at an elevation of 21,560 meters (about 13 miles) above sea level.

The highest wind velocity observed in the free-air layers from the surface up to 2,500 meters during the month of June in the last 5 years was 63.3 m. p. s. (142 m. p. h.) reported on June 19, 1938, as blowing from the south at an elevation of 2,470 meters over Modena, Utah. In the free-air layer from 2,500 to 5,000 meters the corresponding maximum wind for the month during the 5-year period was 67.4 m. p. s. (151 m. p. h.) reported on June 3, 1939, as blowing from the SW. at an elevation of 3,960 meters over Reno, Nev. The highest wind velocity which has been observed at elevations above 5,000 meters in June during the last 5 years was that observed over Albuquerque in June of this year. (See previous paragraph.)

TABLE 1.—Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during June 1941

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																Buffalo, N. Y. (221 m.)				Charleston, S. C. (14 m.)							
	Albuquerque, N. Mex. (1,620 m.)				Atlanta, Ga. (300 m.)				Bismarck, N. Dak. (505 m.)				Boise, Idaho (864 m.)				Brownsville, Tex. (6 m.)				Buffalo, N. Y. (221 m.)				Charleston, S. C. (14 m.)			
	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity
Surface.....	30	837	19.4	42	29	982	21.9	81	30	954	16.4	81	29	913	15.2	68	30	1,013	25.8	91	30	989	16.4	78	30	1,014	22.2	93
500.....	—	—	—	—	29	960	22.7	77	30	900	16.4	69	29	899	17.4	61	30	904	21.0	82	30	903	15.9	63	30	959	21.6	77
1,000.....	—	—	—	—	29	906	20.4	73	30	799	11.0	66	29	799	11.9	53	30	804	16.8	63	30	805	12.8	65	30	854	16.2	69
1,500.....	—	—	—	—	29	855	17.0	74	30	849	13.7	67	29	848	15.3	54	30	853	19.0	72	30	851	12.8	65	30	854	16.2	69
2,000.....	30	801	18.9	41	29	808	13.8	76	30	799	11.0	66	29	799	8.3	55	30	759	14.3	59	30	755	7.0	59	30	758	10.2	68
2,500.....	30	756	15.4	40	29	759	10.8	72	30	753	8.2	62	29	752	8.3	55	30	758	14.3	59	30	755	7.0	59	30	758	10.2	68
3,000.....	30	712	11.3	40	29	715	7.9	71	30	708	5.4	58	29	708	5.0	58	29	715	11.6	57	30	710	4.6	55	30	714	7.7	64
4,000.....	30	631	8.1	48	29	633	2.8	63	29	626	-0.6	54	29	625	-2.0	62	29	634	6.0	55	30	627	-0.4	49	30	632	2.3	64
5,000.....	30	557	-4.8	61	29	559	-2.5	59	29	552	-7.1	50	28	551	-8.9	59	29	560	0.0	56	28	553	-6.2	41	29	558	-3.2	59
6,000.....	30	489	-11.9	61	29	402	-8.6	56	29	484	-13.9	46	28	483	-16.1	59	29	494	-6.3	56	28	486	-12.5	38	27	491	-9.3	57
7,000.....	30	429	-18.7	59	29	432	-15.1	49	29	424	-21.1	44	27	422	-23.0	57	28	434	-12.9	54	28	426	-19.0	36	27	431	-15.7	54
8,000.....	30	374	-25.9	55	29	378	-22.2	48	28	369	-28.3	43	27	368	-29.8	55	27	380	-19.9	54	28	371	-26.0	35	26	376	-22.1	52
9,000.....	30	325	-33.2	53	29	328	-29.2	45	28	320	-36.2	43	27	319	-37.1	53	27	331	-27.1	53	28	322	-33.4	35	26	327	-29.4	49
10,000.....	30	282	-40.8	—	29	285	-36.9	44	28	277	-44.2	—	27	276	-44.5	—	27	288	-34.4	52	28	279	-41.3	—	26	284	-36.9	45
11,000.....	30	243	-47.4	—	29	246	-44.8	—	28	238	-51.2	—	27	237	-50.8	—	27	249	-42.2	—	28	241	-48.1	—	26	245	-45.1	—
12,000.....	30	208	-51.9	29	212	-52.0	—	27	204	-55.2	—	27	202	-54.4	—	27	214	-49.9	—	28	206	-54.4	—	26	211	-53.4	—	
13,000.....	29	178	-55.8	—	29	181	-58.6	—	26	174	-56.9	—	26	173	-54.7	—	25	183	-57.3	—	28	176	-59.0	—	26	180	-60.3	—
14,000.....	29	152	-58.4	—	28	154	-62.3	—	24	148	-57.3	—	26	148	-54.1	—	25	156	-64.1	—	27	151	-60.6	—	25	153	-64.6	—
15,000.....	29	129	-60.6	—	28	131	-64.0	—	24	126	-57.0	—	25	126	-54.2	—	23	132	-68.9	—	26	128	-60.6	—	25	129	-66.6	—
16,000.....	28	110	-61.9	—	26	112	-65.0	—	21	108	-56.5	—	23	108	-54.3	—	18	112	-72.9	—	25	109	-60.2	—	24	110	-66.8	—
17,000.....	28	94	-62.2	—	23	94	-65.2	—	17	92	-56.2	—	22	92	-54.9	—	18	94	-74.2	—	24	92	-59.4	—	22	93	-66.6	—
18,000.....	28	79	-60.7	—	19	80	-64.2	—	12	78	-55.8	—	17	79	-64.7	—	16	79	-71.5	—	20	78	-58.8	—	21	79	-65.1	—
19,000.....	15	68	-58.8	—	13	68	-62.0	—	7	67	-55.3	—	13	68	-64.5	—	10	67	-66.7	—	15	67	-57.4	—	14	67	-63.0	—
20,000.....	—	—	—	—	11	58	-58.4	—	—	—	—	—	6	57	-63.2	—	6	57	-56.0	—	6	56	-61.4	—	—	—	—	—

TABLE 1.—Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during June 1941—Continued

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																		Medford, Oreg. (401 m.)				Miami, Fla. (4 m.)						
	Denver, Colo. (1,616 m.)				El Paso, Tex. (1,193 m.)				Ely, Nev. (1,908 m.)				Great Falls, Mont. (1,128 m.)				Lakehurst, N. J. ¹ (39 m.)				Medford, Oreg. (401 m.)				Miami, Fla. (4 m.)				
	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations				
Surface	30	838	15.1	70	30	880	23.1	39	30	808	10.8	58	30	886	14.9	66	30	1,010	16.4	88	30	968	15.7	66	30	1,017	23.6	91	
500																													
1,000																													
1,500																													
2,000	30	801	15.3	60	30	802	19.8	38	30	800	13.2	55	30	798	11.8	60	30	802	10.2	72	30	799	5.8	79	30	807	14.3	70	
2,500	30	754	12.3	57	30	756	15.8	36	30	754	12.0	49	29	752	8.0	60	30	755	7.5	68	30	752	3.2	75	30	761	11.6	65	
3,000	30	710	8.6	58	30	713	11.8	37	30	710	7.9	49	29	707	4.4	65	30	710	5.0	63	30	706	0.7	65	30	717	8.9	62	
4,000	30	629	1.2	61	30	631	3.6	45	30	627	-0.2	52	28	625	-2.2	69	30	628	0.2	57	29	623	-4.8	56	30	635	3.1	60	
5,000	30	554	-6.8	63	30	558	-4.2	53	30	553	-7.7	54	28	550	-8.8	63	30	554	-5.1	49	29	548	-11.0	47	30	561	-2.7	59	
6,000	30	487	-13.5	55	30	490	-10.7	53	30	486	-14.4	52	28	483	-15.4	58	30	487	-11.2	48	29	480	-17.9	43	30	494	-8.3	55	
7,000	30	426	-20.3	50	30	430	-17.2	45	30	425	-21.5	49	28	422	-22.5	61	30	427	-17.8	51	29	419	-25.0	42	30	434	-14.8	53	
8,000	30	372	-27.6	47	30	375	-24.4	43	27	370	-28.8	46	27	368	-30.0	58	30	372	-24.6	57	29	364	-32.7	42	28	379	-21.6	50	
9,000	30	322	-35.2	46	30	326	-31.4	42	27	321	-36.5	45	27	319	-37.7	58	30	323	-32.1	59	29	315	-39.9	42	28	330	-28.7	49	
10,000	29	279	-43.1	41	29	283	-39.1	40	26	278	-44.4	44	27	276	-45.7	47	28	270	-39.5	55	28	272	-46.6	47	27	287	-36.0	47	
11,000	29	240	-49.9	41	29	244	-46.2	42	26	238	-50.7	47	27	237	-52.5	47	28	242	-46.9	51	28	234	-51.1	47	27	248	-43.8	47	
12,000	29	205	-54.7	41	29	210	-52.5	41	25	204	-56.0	47	27	202	-55.8	47	27	207	-53.7	52	28	200	-54.2	47	27	213	-51.6	47	
13,000	28	176	-57.1	41	29	179	-57.2	41	25	174	-57.6	47	27	173	-55.3	47	26	177	-59.4	52	28	171	-54.4	47	23	182	-59.2	47	
14,000	28	150	-58.3	41	29	153	-60.8	41	25	148	-57.7	47	27	148	-54.4	47	24	151	-59.5	52	27	146	-53.8	47	23	155	-65.9	47	
15,000	28	128	-59.6	41	29	130	-63.6	41	25	127	-58.4	47	25	126	-55.0	47	24	129	-59.0	52	24	125	-53.6	47	22	131	-70.4	47	
16,000	25	109	-59.6	41	28	110	-65.9	41	24	108	-58.6	47	24	108	-55.0	47	22	110	-59.7	52	20	107	-53.5	47	22	111	-71.5	47	
17,000	22	93	-59.0	41	28	94	-66.1	41	22	92	-58.4	47	23	92	-55.2	47	18	93	-58.9	52	16	91	-53.9	47	20	94	-70.9	47	
18,000	12	79	-58.2	41	21	78	-63.7	41	18	78	-58.2	47	21	79	-55.3	47	13	79	-57.5	52	8	77	-53.9	47	15	79	-68.4	47	
19,000	9	68	-57.2	41	12	67	-60.8	41	9	67	-57.2	47	16	68	-55.1	47	5	67	-55.6	52	8	67	-55.6	47	13	67	-64.8	47	
20,000	7	49	-55.5	41																									

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																		Medford, Oreg. (401 m.)				Miami, Fla. (4 m.)					
	Nashville, Tenn. (180 m.)				Norfolk, Va. ^{1,2} (10 m.)				Oakland, Calif. (2 m.)				Oklahoma City, Okla. (391 m.)				Omaha, Nebr. (301 m.)				Pensacola, Fla. ^{1,3} (24 m.)				Phoenix, Ariz. (339 m.)			
	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity				
Surface	30	994	22.4	72	21	1,017	20.5	80	30	1,015	15.4	77	30	969	21.2	83	29	977	19.9	81	30	1,015	25.7	83	30	969	23.9	36
500	30	958	23.3	66	21	960	20.6	61	30	957	14.0	74	30	957	21.9	78	29	955	20.2	73	30	961	29.4	30	30	951	22.6	30
1,000	30	905	19.9	67	21	906	18.1	68	30	902	14.3	56	30	903	20.1	70	29	901	18.0	71	30	907	20.4	73	30	899	26.8	26
1,500	30	854	18.2	72	21	855	15.4	61	30	850	12.5	46	30	852	16.9	72	29	850	15.0	70	30	857	17.5	73	30	849	23.1	25
2,000	30	804	12.7	70	21	806	12.4	66	30	800	10.1	42	30	803	14.0	67	29	801	11.9	68	30	807	14.8	70	30	801	18.8	26
2,500	30	758	9.6	65	21	759	9.7	63	30	753	7.4	40	30	757	11.3	59	29	754	8.9	68	30	761	12.3	66	30	755	14.5	27
3,000	30	713	7.1	58	21	714	6.9	58	30	709	4.8	35	30	713	8.0	59	29	710	5.9	66	30	716	3.8	63	30	730	10.3	33
4,000	30	631	1.5	46	21	631	1.6	52	30	626	-1.2	33	30	631	2.1	48	28	628	0.5	60	30	635	3.8	63	30	630	2.8	33
5,000	30	557	-3.5	39	13	557	-4.5	35	30	552	-7.6	32	29	557	-4.0	49	27	554	-5.4	50	28	561	-2.0	61	30	556	-3.6	33
6,000	30	490	-10.0	36		484	-14.5	33	30	490	-9.9	47	27	487	-11.9	46	22	494	-8.2	62	30	490	-10.8	30				
7,000	30	430	-16.8	34		424	-21.4	32	29	429	-16.3	42	27	427	-18.6	44	20	433	-14.8	61	30	429	-18.3	28				
8,000	30	375	-23.6	32		370	-28.7	32	27	375	-23.5	40	27	372	-26.2	42	15	378	-21.9	54	30	374	-25.9	28				
9,000	29	326	-30.9	31		320	-35.9	32	27	326	-30.9	39	27	323	-33.7	40	14	329	-29.2	56	30</							

TABLE 1.—Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during June 1941—Continued

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																				Sault Ste. Marie, Mich. (221 m.)				
	Portland, Maine (19 m.)					St. Louis, Mo. (171 m.)					St. Paul, Minn. (225 m.)					San Antonio, Tex. (174 m.)					San Diego, Calif. ¹ (19 m.)				
	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	
Surface	30	1,011	14.0	82	30	994	21.2	77	29	986	18.3	82	30	994	24.1	89	29	1,011	17.7	81	30	988	13.8	78	75
500	30	956	17.2	69	30	957	22.0	69	29	956	18.6	75	30	905	21.1	85	29	901	16.6	53	30	902	14.7	66	78
1,000	30	901	14.7	68	30	903	19.0	68	29	901	16.6	73	30	905	21.1	77	29	849	16.3	36	30	850	11.6	67	82
1,500	30	849	11.5	68	30	852	15.4	71	29	850	13.9	74	30	854	18.7	77	29	800	14.7	29	30	800	8.8	69	84
2,000	30	799	8.0	68	30	802	11.9	73	29	800	11.6	70	30	805	16.2	70	29	754	13.7	62	30	753	5.9	68	80
2,500	30	752	5.5	64	29	756	9.3	67	29	754	9.1	63	30	759	11.2	62	29	754	11.8	28	30	753	3.3	62	74
3,000	30	708	2.9	61	29	711	6.7	64	29	710	6.5	62	30	715	12.2	56	29	620	12.1	55	30	620	-2.1	55	65
4,000	30	625	-2.8	59	29	629	1.3	60	29	628	1.3	51	30	634	5.1	51	29	629	2.8	24	30	626	-7.4	69	69
5,000	28	550	-8.2	57	29	555	-4.5	53	29	554	-4.8	49	29	560	-1.1	49	29	555	-3.7	23	29	551	-8.0	47	56
6,000	28	483	-14.6	53	29	488	-11.0	48	29	487	-11.2	44	29	493	-7.2	43	29	488	-11.0	27	29	484	-14.3	44	67
7,000	25	422	-21.4	51	29	428	-17.8	44	29	427	-18.1	41	28	433	-14.0	41	29	428	-18.3	36	28	423	-21.0	42	71
8,000	25	368	-28.7	50	28	374	-25.0	45	29	373	-25.7	38	28	379	-21.0	39	25	372	-26.2	28	28	369	-27.9	40	74
9,000	22	319	-36.2	47	28	324	-32.2	41	29	324	-33.1	36	28	330	-28.2	39	24	323	-34.1	27	30	320	-35.3	39	41.8
10,000	17	276	-43.7	27	27	282	-39.5	29	280	-40.5	28	287	28	287	-35.3	38	22	280	-41.6	27	27	277	-42.6	29	47.9
11,000	15	238	-49.5	27	243	-46.6	29	242	-47.4	28	248	-42.7	21	241	-48.7	27	248	-49.0	26	238	-49.0	28	232	-51.3	28
12,000	13	204	-52.7	27	208	-52.6	29	208	-52.8	28	213	-50.1	21	206	-55.3	25	205	-53.8	28	199	-52.4	28	199	-52.2	28
13,000	12	175	-55.0	27	178	-57.1	29	177	-56.2	27	183	-57.1	19	178	-59.4	25	174	-56.9	26	171	-52.2	26	171	-52.0	26
14,000	12	149	-55.5	27	152	-59.2	28	151	-57.8	26	155	-62.9	15	150	-62.3	23	149	-57.7	24	147	-52.0	24	147	-52.0	24
15,000	11	128	-56.5	26	129	-60.8	28	129	-58.1	25	132	-67.0	9	127	-64.0	23	127	-68.1	23	128	-62.0	23	128	-62.0	23
16,000	8	110	-55.2	26	110	-61.1	28	110	-57.5	25	112	-70.0	9	108	-65.0	22	109	-68.1	22	108	-53.0	22	108	-53.0	22
17,000	8	93	-54.6	20	94	-61.7	25	94	-56.9	25	94	-69.7	6	92	-64.8	19	93	-57.4	17	92	-53.0	17	92	-53.0	17
18,000				13	79	-61.3	22	80	-58.4	20	80	-67.1	18	79	-58.0	15	78	-58.8	15	78	-53.8	15	78	-53.8	15
19,000				9	68	-60.3	17	68	-55.2	14	68	-63.9	9	67	-54.8	8	68	-54.8	8	66	-54.5	8	66	-54.5	8
20,000				5	58	-58.0	15	58	-53.7	6	57	-58.7	6	57	-58.7	6	57	-58.7	6	57	-58.7	6	57	-58.7	6

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																				Sault Ste. Marie, Mich. (221 m.)														
	Spokane, Wash. (598 m.)					Washington, D. C. (25 m.)					Anchorage, Alaska (41 m.)					Atlantic Station No. 1 ³ (3 m.)					Atlantic Station No. 2 ⁴ (3 m.)					Barrow, Alaska (6 m.)					Coco Solo, C. Z. ^{1,2} (15 m.)				
	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity							
Surface	30	944	15.2	73	30	1,014	19.9	82	30	952	11.2	70	29	904	15.8	82	29	961	19.5	83	30	906	13.5	85	30	896	15.9	85	30	957	27.1	91	83		
500	30	900	15.1	62	30	905	17.4	70	30	896	7.9	74	29	904	13.2	79	23	854	11.3	73	23	854	11.5	73	30	841	0.8	55	18	904	22.2	80			
1,000	30	848	12.0	61	30	853	14.7	72	30	843	4.5	77	29	852	11.3	77	29	802	8.8	68	23	804	9.7	61	30	790	-1.5	58	18	853	19.3	80			
1,500	30	799	8.6	65	30	804	11.7	74	30	793	1.4	77	29	755	6.5	63	23	756	7.2	56	30	742	-4.0	58	17	759	14.1	61	61						
2,000	30	752	5.1	60	30	757	8.8	73	30	745	-1.7	79	29	710	4.0	54	23	712	4.7	54	30	696	-6.8	59	16	715	11.6	62	62						
2,500	30	708	1.9	69	30	713	6.0	66	30	699	-4.7	79	29	627	-1.0	47	23	629	-0.4	48	30	611	-12.7	54	7	633	4.0	63	63						
3,000	30	649	-10.7	65	30	558	-4.4	54	29	540	-17.1	73	27	553	-6.6	42	29	555	-6.2	44	30	536	-18.6	52	52	555	27.1	91	83						
4,000	30	481	-17.5	64	28	488	-10.6	50	28	472	-23.7	67	25	486	-13.0	42	20	487	-12.2	39	30	468	-26.5	49	49	487	27.1	91	83						
5,000	30	420	-24.2	61	28	428	-17.0	47	28	410	-30.7	64	24	425	-19.8	43	20	427	-19.1	39	30	406	-33.6	47	47	427	27.1	91	83						
6,000	30	364	-31.5	59	28	374	-24.5	45	28	356	-38.2	63	23	370	-26.9	43	20	372	-26.2	38	30	351	-40.8	48	48	372	27.1	91	83						
7,000	30	318	-39.1	56	28	325	-31.6	42	27	307	-45.5	43	22	321	-33.7	43	20	323	-33.6	36	30	303	-47.1	48	48	323	27.1	91	83						
8,000	30	273	-46.4	28	282	-39.1	41	26	264	-51.5	27	22	278	-41.4	19	18	280	-41.0	30	260	-49.9	24	241	-48.5	30	224	-48.2	30	224	27.1	91	83			
9,000	29	234	-52.2	26	243																														

TABLE 1.—Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during June 1941—Continued

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																												
	Fairbanks, Alaska (156 m.)				Juneau, Alaska (49 m.)				Ketchikan, Alaska (26 m.)				Nome, Alaska (14 m.)				Pearl Harbor, T. H. ¹² (7 m.)				St. Thomas, V. I. ¹² (8 m.)								
	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity					
Surface	29	989	19.4	45	29	1,007	14.3	72	30	1,011	14.1	72	28	1,009	11.2	73	30	1,016	22.8	81	29	1,018	27.7	74	30	1,013	27.3	84	
500	29	950	16.5	44	29	934	10.8	75	29	952	10.8	78	28	936	7.7	60	30	906	17.9	84	29	908	20.1	82	30	905	21.1	84	
1,000	29	896	12.3	44	29	898	7.1	79	30	900	7.6	82	28	843	5.0	60	30	855	15.1	83	29	858	17.5	74	30	854	18.3	78	
1,500	29	843	8.2	47	29	845	3.7	83	30	847	4.4	86	28	793	2.4	55	30	806	13.9	67	29	809	15.5	63	30	805	16.1	66	
2,000	29	794	4.4	56	29	794	0.7	83	30	796	1.7	85	28	745	-0.3	52	30	759	13.2	43	29	768	13.7	52	30	759	13.0	54	
2,500	29	746	0.4	56	28	746	-2.2	81	30	748	-0.9	80	28	700	-3.3	48	30	715	12.1	22	29	719	11.1	49	30	716	11.1	49	
3,000	29	700	-3.3	60	26	700	-5.0	77	30	702	-3.8	73	28	616	-9.6	67	30	634	7.1	22	29	638	5.4	46	30	634	5.3	47	
4,000	29	616	-9.8	60	25	616	-11.0	69	30	618	-9.6	67	28	542	-16.0	62	27	540	-16.9	44	5	560	1.6	29	30	561	-0.3	40	
5,000	29	541	-16.7	56	23	540	-17.6	59	28	542	-16.0	62	27	540	-16.9	44	5	560	1.6	29	30	561	-0.3	40	30	561	-0.3	40	
6,000	28	472	-23.6	52	22	472	-24.6	56	26	474	-22.7	58	27	472	-24.0	43	27	472	-24.0	43	29	494	-8.7	40	29	494	-8.7	40	
7,000	28	411	-30.5	50	20	409	-31.8	55	22	413	-29.4	56	27	411	-31.3	44	27	411	-31.3	44	29	434	-12.8	36	29	434	-12.8	36	
8,000	27	356	-38.0	48	18	355	-39.2	19	26	358	-36.4	54	26	356	-38.9	44	26	357	-35.6	56	27	380	-19.6	35	27	380	-19.6	35	
9,000	27	308	-45.3	16	16	306	-46.4	18	26	309	-43.8	18	26	307	-45.6	26	26	264	-50.9	27	331	-26.5	33	27	331	-26.5	33		
10,000	27	264	-51.3	15	15	263	-52.0	18	26	266	-49.2	23	23	264	-50.9	23	23	227	-49.7	27	249	-42.3	33	27	249	-42.3	33		
11,000	27	227	-49.7	15	15	226	-52.2	18	22	229	-51.8	20	20	227	-49.7	20	20	195	-46.3	24	214	-50.3	33	24	214	-50.3	33		
12,000	27	194	-46.5	15	15	194	-49.8	18	18	196	-50.0	20	20	195	-46.3	20	20	188	-44.9	23	183	-58.5	33	23	183	-58.5	33		
13,000	27	167	-43.9	12	12	166	-47.8	17	17	168	-48.4	20	20	168	-44.9	20	20	155	-44.5	20	156	-66.4	33	20	156	-66.4	33		
14,000	27	144	-43.6	8	8	143	-47.6	15	15	145	-48.1	18	18	144	-44.5	18	18	125	-44.4	18	18	111	-77.3	33	20	111	-77.3	33	
15,000	27	123	-43.3	8	8	122	-47.6	14	14	124	-48.3	18	18	125	-44.4	18	18	108	-44.3	18	18	93	-77.9	33	18	93	-77.9	33	
16,000	26	108	-42.7	8	8	105	-47.8	11	11	107	-49.1	16	16	108	-44.3	16	16	80	-43.9	16	16	78	-73.1	33	16	78	-73.1	33	
17,000	26	92	-42.4	7	7	90	-48.2	8	8	91	-50.1	15	15	93	-44.1	15	15	69	-43.8	15	15	66	-66.8	33	16	66	-66.8	33	
18,000	25	79	-42.2	5	5	78	-48.8	6	6	78	-50.1	11	11	69	-43.8	11	11	66	-43.8	11	11	56	-62.0	33	8	56	-62.0	33	
19,000	18	68	-41.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20,000	9	58	-41.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LATE REPORTS FOR MAY 1941

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																									
	Anchorage, Alaska (41 m.)				Fairbanks, Alaska (156 m.)				Atlantic Station No. 1 (2 m.)				Atlantic Station No. 2 (3 m.)				Barrow, Alaska (6 m.)									
	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity						
Surface	31	1,005	9.2	61	31	989	11.9	45	22	1,014	17.4	77	28	1,018	17.5	87	31	1,014	-5.6	92	31	952	-7.6	88		
500	31	950	5.9	64	31	949	9.0	47	22	956	13.3	81	28	960	13.9	88	31	952	-7.6	88	31	952	-7.6	88		
1,000	31	893	-1.7	67	31	893	4.9	49	22	900	10.0	82	28	905	11.3	84	31	893	-5.3	76	31	893	-5.3	76		
1,500	30	829	-2.2	71	31	840	-6	51	22	848	7.1	81	28	852	9.0	76	31	837	-6.6	66	31	837	-6.6	66		
2,000	30	787	-6.0	77	31	788	-3.6	55	22	797	4.4	75	28	802	6.7	68	31	785	-9.1	65	31	785	-9.1	65		
2,500	30	738	-9.2	79	31	739	-7.6	60	22	750	1.8	68	28	754	4.4	59	31	738	-11.6	61	31	738	-11.6	61		
3,000	30	692	-12.4	79	31	693	-11.1	62	22	704	0.3	65	28	709	2.1	56	31	689	-14.3	58	31	689	-14.3	58		
4,000	29	606	-18.7	77	31	608	-17.7	62	22	621	-5.3	56	27	626	-3.6	53	30	603	-20.3	55	27	603	-20.3	55		
5,000	28	529	-25.1	74	31	531	-24.5	59	22	546	-11.1	51	27	551	-9.8	51	30	526	-28.5	52	27	526	-28.5	52		
6,000	28	460	-31.9	73	31	462	-31.3	56	22	479	-17.7	53	27	483	-15.9	48	30	457	-33.1	50	27	457	-33.1	50		
7,000	28	398	-38.7	70	31	400	-38.3	55	21	418	-24.3	51	27	422	-22.4	49	30	396	-40.0	48	27	396	-40.0	48		
8,000	28	344	-45.0	30	345	-45.0	20	364	31.4	51	28	368	-28.9	48	30	341	-46.6	48	30	341	-46.6	48	30	341	-46.6	48
9,000	26	298	-49.7	30	296	-50.7	20	315	-37.8	50	24	318	-36.8	46	30	292	-51.1	50	24	292	-51.1	50	24	292	-51.1	50
10,000	25	254	-50.1	30	254	-51.8	20	273	-43.7	21	275	-44.9	28	28	276	-42.4	28	28	276	-42.4	28	25	276	-42.4	28	
11,000	25	218	-48.6	29	219	-48.3	17	235	-48.8	19	237	-52.4	28	28	240	-48.8	28	28	240	-48.8	28	24	240	-48.8	28	
12,000	25	187	-47.1	29	188	-46.6	17	201																		

TABLE 2.—Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during June 1941. Directions given in degrees from North ($N=360^\circ$, $E=90^\circ$, $S=180^\circ$, $W=270^\circ$)—velocities in meters per second.

TABLE 3.—Maximum free-air wind velocities (m. p. s.), for different sections of the United States based on pilot-balloon observations during June 1941

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m) m. s. l.	Date	Station
Northeast ¹	38.9	NW	2,500	9	Boston, Mass.	43.9	NW	2,620	9	Boston, Mass.	61.2	W	12,360	23	Portland, Maine.
East-Central ²	31.4	N	660	5	Richmond, Va.	32.4	WSW	4,170	13	Knoxville, Tenn.	48.0	NW	11,080	5	Nashville, Tenn.
Southeast ³	24.1	W	2,470	15	Atlanta, Ga.	25.4	W	3,600	4	Charleston, S. C.	44.0	WNW	13,970	5	Atlanta, Ga.
North-Central ⁴	34.5	S	1,780	24	Rapid City, S. Dak.	55.8	SW	4,840	26	Rapid City, S. Dak.	50.0	W	12,710	30	S. Ste. Marie, Mich.
Central ⁵	31.4	S	1,830	6	Des Moines, Iowa	31.8	SSW	3,210	8	Dodge City, Kans.	64.0	SW	16,000	30	Wichita, Kans.
South-Central ⁶	29.4	S	1,390	9	Oklahoma City, Okla.	34.0	SW	4,800	10	Abilene, Tex.	66.0	WSW	11,980	11	Abilene, Tex.
Northwest ⁷	34.2	NW	940	28	Ellensburg, Wash.	61.5	WSW	4,280	25	Havre, Mont.	53.0	S	8,390	23	Portland, Oreg.
West-Central ⁸	33.0	NW	1,620	10	Sheridan, Wyo.	56.6	SSW	3,560	26	Modena, Utah	75.5	NNW	10,930	7	Redding, Calif.
Southwest ⁹	34.6	NW	2,500	7	Sandberg, Calif.	39.6	SSW	4,620	9	Roswell, N. Mex.	85.0	W	21,560	17	Albuquerque, N. Mex.

¹ Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.

² Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.

³ South Carolina, Georgia, Florida, and Alabama.

⁴ Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.

⁵ Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.

WEATHER ON THE NORTH ATLANTIC OCEAN

By H. C. HUNTER

Atmospheric pressure.—The pressure during June 1941 averaged below normal near the Azores and especially over waters adjacent to Newfoundland, the Maritime Provinces, and New England. Pressure above normal was the rule over the southwestern and the far eastern portions. For most areas of the ocean readings were higher during the second half of the month than during the first half.

The extremes of pressure noted in the vessel reports now available were 1,030.5 and 989.4 millibars (30.43 and 29.22 inches). The high reading was noted on the 25th, before sunrise, by the American Liner *Excalibur*, near 37½° N., 42° W., and the low by a vessel not far to eastward of Nova Scotia, during the forenoon of the 10th.

TABLE 1.—Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, June 1941

Station	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Millibars	Millibars	Millibars		Millibars	
Lisbon, Portugal ¹	1,018.0	+1.1	1,024	5	1,010	9
Horta, Azores	1,022.9	-1.1	1,029	26	1,014	7
Belle Isle, Newfoundland	1,009.8	-1.4	1,019	2,15	990	26
Halifax, Nova Scotia	1,012.7	-2.2	1,024	13	991	10
Nantucket	1,013.9	-1.3	1,024	13	1,000	5
Hatteras	1,016.3	0.0	1,025	7	1,001	5
Turks Island	1,018.7	+1.8	1,023	28	1,015	4
Key West	1,016.9	+1.3	1,021	7	1,014	5
New Orleans	1,015.9	+0.7	1,021	20	1,011	4

¹ For 26 days.

NOTE.—All data based on available observations, departures compiled from best available normals related to times of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

Cyclones and gales.—The month seems to have been more stormy than June usually is over those portions of the North Atlantic which are well covered by the reports at hand. However, the latter half of the month was less disturbed than the earlier half.

The information indicates two instances in which the wind rose to force 11. The earlier occurred during the night of the 2d-3d, when the cutter *Tampa* noted the storm; its position was about 39° N., 48° W. The low, with which the force 11 was connected, had been located

* Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except extreme west Texas), and western Tennessee.

⁷ Montana, Idaho, Washington, and Oregon.

⁸ Wyoming, Colorado, Utah, northern Nevada, and northern California.

⁹ Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

over the ocean not far from Nantucket on the morning of the 2d, and increased considerably in strength as it traveled eastward during the next 24 hours; its later movement was toward the north-northeast till lost to observation on the 6th.

The later occurrence of force 11 was likewise noted by the *Tampa* but about 300 miles to westward of its location on the 2d-3d. The time was the forenoon of the 7th. The cyclone to which this intense wind was due had shown marked strength as it crossed the coast line near Atlantic City, N. J., during the night of the 4th-5th. It maintained its energy with no noteworthy change as it moved slightly to northward of due east; its speed was slower than that of the preceding center, but like that center it turned to northeastward when near the 60th meridian. It was lost to observation on the 9th.

Fog.—Quite marked contrasts are found in the work charts of occurrence of this month and May just preceding. However, the 2 months were alike, as far as reports show, in the complete absence of fog in areas near the coast from Hatteras southwestward to the Rio Grande.

Between Capes Hatteras and Cod a surprising increase appears in amount of fog noted. The 5° square, 35° to 40° N., 70° to 75° W., is remarkable for the gain in foggy days from 5 in May to 16 in June. This number of 16 is almost twice as great as indicated for this month for any other North Atlantic square; also it is much greater than the normal number for this square in June, though it is not unprecedented. In time distribution there were 4 of the first 5 days which had fog, then 8 days without fog, then 12 days with fog out of the final 17.

To southward of this square, between meridians 70° and 75°, as far as the central Bahamas, where May had furnished no fog reports, June has furnished reports for 5 days between latitudes 35° and 30°, and for 2 days between 30° and 25°.

To eastward and northeastward of Cape Cod, where there had been a moderate number of foggy days during May, hardly any reports have come of June fog, although the records of previous years show that this area is normally as foggy during June as any other part of the North Atlantic Ocean.

For the region between Bermuda and the western Azores, where May had brought several reports of fog, June furnished a very few scattered reports.